

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) An exhaust-aftertreatment-apparatus diagnosis system for an internal combustion engine, comprising:

an exhaust ambience varying section varying a ratio between an oxidizing agent and a reducing agent in exhaust gas of the engine;

an exhaust aftertreatment apparatus disposed in an exhaust passage of the engine, the exhaust aftertreatment apparatus selectively executing an adsorbing operation and a reducing operation of the exhaust gas according to the ratio;

a first exhaust ambience detector disposed upstream of the exhaust aftertreatment apparatus, the first exhaust ambience detector detecting a first ratio between the oxidizing agent and the reducing agent of the exhaust gas upstream of the exhaust aftertreatment apparatus;

a second exhaust ambience detector disposed downstream of the exhaust aftertreatment apparatus, the second exhaust ambience detector detecting a second ratio of the oxidizing agent and the reducing agent of the exhaust gas downstream of the exhaust aftertreatment apparatus;

a first deterioration diagnosing section diagnosing a deterioration of the exhaust aftertreatment apparatus on the basis of the first and second ratios obtained ~~under a first engine operating condition when the exhaust ambience is changed~~ during an engine operating condition change from a lean burn operation to a rich burn operation or from the rich burn operation to the lean burn operation; and

a second deterioration diagnosing section diagnosing the deterioration of the exhaust aftertreatment apparatus on the basis of the second ratio obtained ~~under a second engine operating condition~~ by transiting the engine operating condition to a stoichiometric air/fuel ratio operating condition, when the first deterioration diagnosing section diagnoses that the exhaust aftertreatment apparatus is deteriorated.

2. (Cancelled)

3. (Previously Presented) The diagnosis system as claimed in claim 2, wherein the first deterioration diagnosing section comprises an integral section for calculating an integral quantity of a difference between an output of the first exhaust ambience detector and an output of the second exhaust ambience detector from a first moment that the output of the first exhaust ambience detector is varied to a predetermined value to a second moment that the output of the second exhaust ambience detector is varied to the predetermined value, and the first deterioration diagnosing section diagnoses the deterioration of the exhaust aftertreatment apparatus on the basis of the integral quantity.

4. (Cancelled)

5. (Currently Amended) ~~The diagnosis system as claimed in claim 4, An~~
exhaust-aftertreatment-apparatus diagnosis system for an internal combustion engine,
comprising:

an exhaust ambience varying section varying a ratio between an oxidizing agent and a
reducing agent in exhaust gas of the engine;

an exhaust aftertreatment apparatus disposed in an exhaust passage of the engine, the
exhaust aftertreatment apparatus selectively executing an adsorbing operation and a reducing
operation of the exhaust gas according to the ratio;

a first exhaust ambience detector disposed upstream of the exhaust aftertreatment
apparatus, the first exhaust ambience detector detecting a first ratio between the oxidizing
agent and the reducing agent of the exhaust gas upstream of the exhaust aftertreatment
apparatus;

a second exhaust ambience detector disposed downstream of the exhaust
aftertreatment apparatus, the second exhaust ambience detector detecting a second ratio of the
oxidizing agent and the reducing agent of the exhaust gas downstream of the exhaust
aftertreatment apparatus;

a first deterioration diagnosing section diagnosing a deterioration of the exhaust
aftertreatment apparatus on the basis of the first and second ratios obtained under a first
engine operating condition when the exhaust ambience is changed; and

a second deterioration diagnosing section diagnosing the deterioration of the exhaust aftertreatment apparatus on the basis of the second ratio obtained by transiting the engine operating condition to a stoichiometric air/fuel ratio operating condition, when the first deterioration diagnosing section diagnoses that the exhaust aftertreatment apparatus is deteriorated,

wherein the second deterioration diagnosing section comprises an exhaust air/fuel ratio feedback controlling section for feedback controlling the exhaust air/fuel ratio at ratios near the stoichiometric air/fuel ratio on the basis of the output of the second exhaust ambience detector and a cycle measuring section for measuring a cycle of a feedback quantity during when a feedback control being executed by the exhaust air/fuel ratio feedback controlling section, and the second deterioration diagnosing section diagnoses the deterioration of the exhaust aftertreatment apparatus on the basis of the cycle.

6. (Previously Presented) The diagnosis system as claimed in claim 1, wherein the exhaust aftertreatment apparatus is attached to a compression ignition engine.

7. (Original) The diagnosis system as claimed in claim 1, wherein the first engine operating condition, under which the first deterioration diagnosing section diagnoses the deterioration of the exhaust aftertreatment apparatus, includes a rich spike control condition wherein the engine operating condition is temporally varied from a lean burn condition to a rich burn condition.

8. (Original) The diagnosis system as claimed in claim 1, wherein the second engine operating condition, under which the second deterioration diagnosing section diagnoses the deterioration of the exhaust aftertreatment apparatus, includes a stoichiometric air/fuel ratio control.

9. (Original) The diagnosis system as claimed in claim 1, wherein the exhaust aftertreatment apparatus selectively executes an adsorbing operation of nitrogen oxide in the exhaust gas and a reducing operation of the nitrogen oxide.

10. (Original) The diagnosis system as claimed in claim 1, wherein the first deterioration diagnosing section diagnoses the deterioration of the exhaust aftertreatment apparatus on the basis of the first and second ratios obtained after an operation for temporally varying the engine operating condition from a lean burn condition to a rich burn condition.

11. (Original) The diagnosis system as claimed in claim 1, wherein the exhaust aftertreatment apparatus comprises a NOx trap catalyst.

12. (Original) The diagnosis system as claimed in claim 11, wherein the exhaust aftertreatment apparatus further comprises a diesel particulate trap disposed downstream of the NOx trap catalyst.

13. (Original) The diagnosis system as claimed in claim 12, wherein the exhaust aftertreatment apparatus further comprises an oxidizing catalyst disposed upstream of the NOx trap catalyst.

14. (Original) The diagnosis system as claimed in claim 1, wherein the first deterioration diagnosing section diagnoses the deterioration of the exhaust aftertreatment apparatus on the basis of a change of a catalyst downstream side air/fuel ratio relative to a change of a catalyst upstream side air/fuel ratio during a rich spike control, and the second deterioration diagnosing section diagnoses the deterioration of the exhaust aftertreatment apparatus from an inversion cycle of a feedback quantity during the feedback control of the catalyst downstream side air/fuel ratio during a stoichiometric control when the first deterioration diagnosis made a deterioration determination.

15. (Currently Amended) A method of diagnosing an exhaust aftertreatment apparatus for an internal combustion engine, the exhaust aftertreatment apparatus being disposed in an exhaust passage of the engine and purifying exhaust gas of the engine according to a ratio between an oxidizing agent and a reducing agent in the exhaust gas, which is varied by an exhaust ambience varying section, the method comprising:

detecting a first ratio between the oxidizing agent and the reducing agent of the exhaust gas upstream of the exhaust aftertreatment apparatus;

detecting a second ratio of the oxidizing agent and the reducing agent of the exhaust gas downstream of the exhaust aftertreatment apparatus;

executing a first diagnosis for diagnosing a deterioration of the exhaust aftertreatment apparatus on the basis of the first and second ratios obtained ~~under a first engine operating condition when the exhaust ambience is changed~~ during an engine operating condition change from a lean burn operation to a rich burn operation or from the rich burn operation to the lean burn operation; and

executing a second diagnosis for diagnosing the deterioration of the exhaust aftertreatment apparatus on the basis of the second ratio obtained ~~under a second engine operating condition~~ by transiting the engine operating condition to a stoichiometric air/fuel ratio operating condition, when the first deterioration diagnosing section diagnoses that the exhaust aftertreatment apparatus is deteriorated.

16. (Currently Amended) An exhaust-aftertreatment-apparatus diagnosis system for an internal combustion engine, comprising:

exhaust ambience varying means for varying a ratio between an oxidizing agent and a reducing agent in exhaust gas of the engine;

exhaust aftertreatment means for purifying the exhaust gas by selectively executing an adsorbing operation and a reducing operation of the exhaust gas according to the ratio varied by the exhaust ambience varying means, the exhaust aftertreatment means being disposed in an exhaust passage of the engine;

first exhaust ambience detecting means for detecting a first ratio between the oxidizing agent and the reducing agent of the exhaust gas upstream of the exhaust aftertreatment apparatus, the first exhaust ambience detecting means being disposed upstream of the exhaust aftertreatment apparatus;

second exhaust ambience detecting means for detecting a second ratio of the oxidizing agent and the reducing agent of the exhaust gas downstream of the exhaust aftertreatment apparatus, the second exhaust ambience detecting means being disposed downstream of the exhaust aftertreatment apparatus;

first deterioration diagnosing means for diagnosing a deterioration of the exhaust aftertreatment apparatus on the basis of the first and second ratios obtained ~~under a first engine operating condition when the exhaust ambience is changed~~ during an engine operating condition change from a lean burn operation to a rich burn operation or from the rich burn operation to the lean burn operation; and

second deterioration diagnosing means for diagnosing the deterioration of the exhaust aftertreatment apparatus on the basis of the second ratio ~~under a second engine operating condition~~ by transiting the engine operating condition to a stoichiometric air/fuel ratio operating condition, when the first deterioration diagnosing means diagnoses that the exhaust aftertreatment apparatus is deteriorated.